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ABSTRACT

Santa Fe Community College (SFCC) has developed a series of minority science, engineering, and mathematics (SEM) programs to address the growing need for students receiving college and advanced degrees in science-based career fields and the underrepresentation of minorities in these fields. The goals of the SEM programs are to interest more women and minorities in pursuing SEM degrees; prepare students for the academic and personal challenges of college; improve the probability of student success in SEM programs; and increase the number of transfer students. Current SEM programs at SFCC include: (1) the Young Scholars program, a 4-week summer program for 7th and 8th graders focusing on Water Quality and Artificial Life; (2) a Summer Institute Pre-College Bridge program, an 8-week summer session including a math/science class, college orientation, and career counseling; (3) scholarships to cover tuition, books, and fees; (4) a faculty mentoring program; (5) an SEM Hispanic Organization; (6) tutorial labs for developmental, entry-level, and other science and math courses; (7) distance learning; (8) recruitment activities, including visits to area high schools; and (9) work study positions in the Math/Science department. Decisions related to what programs to propose and how they should be run are made by all members of the Math/Science Department. Program coordination is handled by the Math/Science Coordinator, an educational technician who handles grant writing and program administration and evaluation, and faculty members. Evaluation results indicate that the Summer Institute is effective in encouraging student to take science and math courses and preparing them to succeed in the courses and that the Tutorial Labs reduced attrition. (KP)

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Comprehensive Minority

SEM Programs

at

SANTA FE COMMUNITY COLLEGE

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INTRODUCTION

As with most schools, Santa Fe Community College has a series of minority science, engineering, mathematics (SEM) programs. The need for minority programs disciplines is well documented. The demand for qualified scientists and engineers is rising rapidly as our nation becomes an increasingly technology-oriented society (National Science Foundation,"An Action Plan for the Future", 1992). Yet the supply of students receiving college and advanced degrees in science-based career fields is not keeping pace with the demand (U. S. Department of Energy,"Pre-Freshman Enrichment Program", 1991). These facts, combined with the under representation of minorities in SEM disciplines, has been recognized by many agencies. The National Science Foundation, Department of Energy, Department of Education, MESA, and more all are focused on increasing the pool of minorities in SEM disciplines; however, many programs have failed. Some reasons for program failures were stated in "What Went Wrong: Why Programs Failed," Science, November 13, 1992, and include:

-Programs operated with little oversight or assessment,

-Budgets had inconsistent funding, appeared one year and vanished the next,

-Programs targeted college-age students but failed to address the root of the problem in elementary and secondary schools.

Santa Fe Community College has developed a series of minority SEM programs to address the needs of minority students in SEM disciplines and has attempted to avoid some of the characteristics that cause programs to fail. SFCC presently has minority SEM programs in precollege, summer bridge, mentoring, tutorial labs, scholarships, student work study, and transition to the four year institution. Although funding for SFCC's minority SEM programs comes from a variety of sources, all of the programs are coordinated out of one office, must address overall goals for SEM programs, and must include an appropriate evaluation plan. We believe this overall coordination and appropriate evaluation helps make SFCC's minority SEM programs work.

The presentation will focus on the goals of the minority SEM programs at SFCC, the types of minority SEM programs that exist, how they are funded, how they are coordinated, and how they are evaluated. The presentation will allow time for discussion and questions.

GOALS

1. To interest more women, and minority students in pursuing a degree in Science, Engineering and Mathematics (SEM) related fields.

2. To prepare these students for both the academic and the personal challenges they will face in college.

3. To improve the probability of success for all minority and women students in college SEM programs.

4. To increase the number of transfer students to four year university programs in SEM disciplines.

HISTORY

1989 Minority and Women in Science Summer Institute
- Pre-college and Bridge Program

1991 Minority Science Improvement Program (MSIP)
- equipment
- curriculum
- tutorial labs

1993 NM Space Grant Consortium (Space Grant)and the Coalition to Increase Minority Degrees (CIMD) helps expand programs
- SEM Hispanic Organization
- mentoring

1994 NM Alliance to Increase Minority Participation (AMP) helps to expand programs
- SEM scholarships
- student work study
- distance learning

1995 Young Scholars Program is added (hopefully)

MINORITY MATH/SCIENCE PROGRAMS
SANTA FE COMMUNITY COLLEGE

PROGRAM	DESCRIPTION	CURRENT FUNDING	PROPOSED FUNDING
YOUNG SCHOLARS	4 week summer program for 7th and 8th grade students. Focus is Water Quality and Artificial Life with science and math activities.		NSF
SUMMER INSTITUTE PRE-COLLEGE BRIDGE	8 week summer session: * math/science class * college orientation * career counseling * lecture	SFCC - admin AMP (Bridge) Space Grant (H.S.)	
SCHOLARSHIPS FRESHMAN/ SOPHOMORE	* 15 full-time equivalent * cover tuition/ books/fees/ related * 1,500/yr full-time * 750/yr part-time	AMP	
MENTORING	* 10 students/ 1 faculty * students self selected or referred by math/science instructor - individual mentoring - group study activities - social activities	Space Grant CIMD SFCC	

SEM Hispanic Organization	Student organization for Hispanic Science/Engineering and mathematics students. Faculty contact: Steve Peralta	SFCC	
TUTORIAL LABS	Continuation of group tutorial labs for target courses: * Developmental * Entry Level Science * Math 130, 150, 155 * Selected courses based on need	SFCC MSIP AMP	
DISTANCE LEARNING	Higher level semester courses that would be offered through NMSU but not on our campus	SFCC	
RECRUITMENT ACTIVITIES	Visits with area high school seniors and councilors to discuss SEM majors, financial aid, and AMP activities	AMP	
WORK STUDY	Students working in the Math/Science department as lab assistants, tutors and student aids	AMP	

COORDINATION

I) In the past (when we were smaller)

STATE: College was still in it's early growing stages. Although there was support for minority programs SFCC's human resources were stretched thin. The word was "if you want it done somehow do it with existing resources.".

DESC: Decisions related to what programs to propose and how they should be run were addressed by all the members of the Math/Science Department but all coordination activities fell on the Math/Science Coordinator.

STAFF: Math/Science Coordinator was also minority SEM programs coordinator and administrator. Duties included:

- -seek funding
- -administer programs
- -perform evaluation and reporting duties

Faculty responsibilities related to proposing programs and assist in the development of the programs.

II) Present

STATE: The college is now in it's second decade. We are now in permanent facilities. Staffing has improved partially due to grant funding.

DESC: Decisions as to what programs to propose and how they should be run are still made including all the members of the Math/Science Department. The coordination of the programs is now handled by the Math/Science Coordinator, an educational tech who assists in grant writing, program administration, and program evaluation, and individual faculty members who administer the academic aspects of their programs. Two people, the Math/Science Coordinator and the educational tech, have knowledge of all the SEM programs on campus.

STAFF: Math/Science Coordinator's responsibilities have moved to coordination of the grant and away from administration of the grants. He is responsible to see that the proposed programs meet the needs of the students, follow the mission of the college, and do not duplicate efforts of existing programs.

An educational tech performs the administrative duties related to grant reporting and evaluation. The tech also assists faculty in the writing of their proposals.

Faculty not only assist in program development, they also take part in the administration of the academic aspects of their programs.

EVALUATION

I) Summer Institute (high school and bridge)

Students involved in the high school portion of the summer institute successfully will be tracked once they return to high school. It is expected that the students will take the next courses in the mathematics and science sequences and succeed in these courses (C or better). The success rate of students during the institute and in their next math or science course will be one measure of the relative success of the program. Students from both levels will be tracked once they graduate from high school. What will be of interest is if these students enter college and, if they enter college, do they choose a mathematics or science related field. The proportion of students who go onto college and choose a mathematics or science related field should be higher than the proportions from students of similar backgrounds.

II) Tutorial Labs

The tutorial laboratories are evaluated by quantitative and qualitative measures. To measure qualitative aspects of the labs students are given surveys at the conclusion of each semester. Question regarding student satisfaction with the labs and how the students felt the labs helped them succeed in school are asked. Qualitative measures include numbers of students served, class performance data, and student retention. In the class performance and retention measures, based on early performance in the class, students involved in the labs are matched up with students not attending the labs, both groups are followed throughout the semester.

III) Other evaluation measures of SEM programs

SFCC has a Student Outcomes Study model which measures aspects of programs college wide. Some of the studies that are used to evaluate SEM programs include:

-Course Success Withdrawal Study
-Final Grade Correlation Study
-College Transfer Study

SFCC also keeps track the number of majors and degrees awarded by ethnic background.

SOME RESULTS

This section is to give you a flavor of what type of evaluations take place. It is not meant to be a complete summary of all SFCC does to evaluate it's SEM programs.

I) Summer Institute (high school and bridge)

This is the fifth year for the Minority and Women in Science Summer Institute. This summer we will have 18 students involved in the program. In the first four years the institute has served 57 students. Of the 57 students 46 took the next level of mathematics or science when they returned to high school. Additionally, the information from our student tracking system indicates that of 14 students located after high school graduation, 12 are attending college and 11 of those students are math/science majors.

Last year 16 students representing Santa Fe High School, Capital High, and St. Catherine's Indian School were involved in the institute.

	Males (4)	Females (12)	Total(16)
Anglo	0	1	1
Hispanic	4	10	14
Am. Indian	0	1	1

One student withdrew from the program because of a conflict with extra-curricular activities at his high school and one student became ill and had to withdraw from the program. The fourteen students that completed the program took 24 classes. Classes included Intermediate Algebra, College Algebra & Trigonometry, Calculus I, General Physics, and General Chemistry. Some students took one class but many took both a mathematics and science class.

Academically the students were able to compete with college level students. Grades received in the classes were; 8 As, 6 Bs, 1 C, 2 Ds, 2 Fs. One student changed her status to audit, because she missed a week of school, and four withdrawals were recorded. A grade of C or above was considered a success. Grades of D, F, AU, and W were considered non success. The success rate for Summer Institute students was 62.5%. This rate is equivalent to the success rate for mathematics and science students in the general population. Of the 16 students who started the program, three went on to college, two are now be engineering majors at New Mexico State University and one is a health science major here at SFCC. All the remaining thirteen students plan on taking a mathematics or science class when they return to high school.

At the exit interviews, comments were generally good. The one comment that did have some impact was a statement that indicated that it seemed that some students participated more fully in the program than others. The students who succeeded in the program turned out to be those students who formed close associations with other students in the program and took advantage of all the special sessions. In general, the students who just came and went on their own were the students who did poorly in their courses. This result is similar to what has happened in the past. Because the trend is consistent we feel that a change in the program is needed.

II) Tutorial Labs

During the fall of 1993, 193 different students were tutored under the tutorial labs program. This group was matched with a group of students who did not utilize the labs. When the two groups were compared, at the end of the semester, the average score for the tutored group was higher ($p<.05$) than the non tutored group. In addition to having an higher average, the tutored group had a significantly lower attrition rate than the non tutored group ($p<.01$). The attrition for the tutored students was 15% as compared to 33% for the non tutored students.

III) Other results

A) A summary of SFCC's 1992/93 Success and Withdrawal Rate Study is included below. This study is done annually. In the complete report, results are split out by course, gender, and ethnic background.

Table I
Success and Withdrawal/Audit Rates by Discipline

Discipline	N	Success	WD/AU
Astronomy	90	73.3	23.3
Biology	453	81.2	15.7
Chemistry	215	69.3	25.1
CIS	285	70.2	22.8
Engineering	29	96.6	3.5
Geology	78	88.5	10.3
Mathematics	1501	63.0	23.1
Physics	72	94.4	5.6
Total	2743	69.0	20.5

All success rates for the disciplines fall in the acceptable to good rate. Mathematics has the lowest success rate with 63 and Engineering has the highest with a 96.6% success rate. Several of the success rates for the disciplines were significantly different from the 1992/93 results. Biology, Engineering, Geology, and Physics all had significantly higher ($p < .05$) success rates. Chemistry had a significantly lower success rate in 1992/93 ($p < .01$). The success rate for the total of all disciplines rose significantly ($p < .01$) from 66.7% in 1991/92 to 69% in 1992/93. The success rate for mathematics is statistically equivalent to the results from the 1987/88 study. In the 1987/88 study 62.7% of the 1015 students who took mathematics succeeded. This result is equivalent to the 1992/93 results ($p > .10$).

Results were split out by sex and ethnic background on each discipline. Comparisons were done where sample sizes permitted. Females did significantly better than males in all disciplines except geology and engineering ($p < .05$). Males did significantly better than females in the geology and engineering disciplines ($p < .01$) although both groups scored in the good range in these disciplines.

When comparing ethnic backgrounds, it was only possible to compare differences between Anglos and Hispanics because of the limited numbers of students in the other ethnic groups. The only significant differences were in mathematics and physics. Anglos did significantly better than Hispanics in mathematics ($p < .01$) and significantly better in physics ($p < .05$). All other differences were not statistically significant or the population was too small to perform a parametric test ($n < 30$).